

## LETTER TO THE EDITOR

### *Sexual Dimorphism in Relation to Foraging Behavior in the Hairy Woodpecker*

Readers of L. Killham's paper (1965. *Wilson Bull.*, 77:134-145) on sexual differences in foraging of the Hairy Woodpecker (*Dendrocopos villosus*) in New Hampshire may be interested in learning something of the morphological correlates of the observed behavioral differences. As Donald R. Giller and I have shown (1963. *Amer. Mus. Nat. Hist. Bull.*, 124:261-266), bill length in species of woodpeckers is almost invariably more dimorphic sexually than are other linear dimensions of body parts such as wing or tarsus, and the degree of sexual dimorphism varies markedly among genera, species, and races. Interpreting this variation in adaptive terms, we predicted that sexual differences in bill size in woodpeckers would prove to be related to differential niche utilization by the sexes, but at the time we had no field data supporting or refuting this contention. I have since been able to demonstrate a relation between degree of sexual difference in foraging behavior and degree of sexual dimorphism in bill size and proportions in species of *Centurus* (Selander, *Condor*, in press), and Killham's work also provides strong support for the hypothesis. Additional data suggesting significant sexual differences in feeding habits of the Hairy Woodpecker, Downy Woodpecker (*Dendrocopos pubescens*), and Northern Three-toed Woodpecker (*Picoides tridactylus*) are found in the work of Massey and Wygant (1954. *U. S. Dept. Agric. Circular* No. 944) on the control of the Engelmann spruce beetle (*Dendroctonus engelmanni*) in Colorado.

From data presented by Ridgway (1914. *U. S. Natl. Mus. Bull.* 50, Part 6:201-228), I have calculated average percentage differences in three linear dimensions for 18 subspecies of the Hairy Woodpecker: bill length (exposed culmen), 11.0%; wing length, 2.1%; and tarsus length, 3.8%. In bill length, the Hairy Woodpecker is unusually dimorphic for a continental species but is exceeded by certain insular types of other genera. Average degrees of sexual dimorphism in bill length in other North American species of *Dendrocopos* are: *D. pubescens*, 4.2%; *D. nuttalli*, 7.2%; *D. scalaris*, 11.0%; *D. stricklandi*, 9.2%; *D. arizonae*, 11.6%; *D. albolarvatus*, 8.9%; and *D. borealis*, 5.1%.

From an ecological standpoint, an estimate of the degree of non-overlap in bill size of the sexes is more significant than percentage dimorphism based on mean measurements. Using measurements of specimens in the Museum of Vertebrate Zoology, I have calculated coefficients of sexual difference (see Mayr et al., 1953. *Methods and principles of systematic zoology*. McGraw-Hill, N.Y.) in bill length (full culmen from base) for the subspecies studied by Killham (*D. v. villosus* from the northeastern United States), which shows a 10.2% difference in bill length, and for the slightly more dimorphic subspecies *D. v. leucothorectis* (12.2% for a sample from California and Nevada). The coefficients indicate 92% joint non-overlap between the sexes in bill length in *D. v. villosus* (C.D. = 1.45) and 95% joint non-overlap for *D. v. leucothorectis* (C.D. = 1.60).

Because of its wide distribution, the Hairy Woodpecker provides exceptionally good material for studies of geographic variation in differential foraging in the sexes in relation to regional variation in quality and quantity of food and in intensity of competitive interactions with other woodpeckers and species of similar adaptive type. However, as noted by Killham (op. cit.:144), such studies must allow for effects of seasonal and secular changes in populations of both predator and prey species as well as in those of competitors. But with these and other variables controlled, analysis of the ecological basis and evolution of sexual dimorphism in size and differential niche utilization would be possible.—ROBERT K. SELANDER, *Department of Zoology, University of Texas, Austin, Texas, 1 July 1965.*